Summer 2011

Technical Bulletin

A technical source for the clients and employees of Osprey Corporation.

Inlet Pressure Control Loop For Osprey Filters

What is it?

The inlet pressure control loop for an Osprey filter monitors the vacuum level at the inlet of the drum filter and adjusts the main fan speed to hold the inlet vacuum at the desired setpoint. As the drum filter stages get dirty (loaded) and experience an increased pressure drop across them, the system automatically adjusts by increasing the main fan speed to generate the additional vacuum required. The actual inlet vacuum is measured with a pressure sensor mounted to the drum filter enclosure, and the desired setpoint is entered on the control panel HMI (operator touch-screen interface). A variable frequency drive (VFD) mounted in the control panel is used to vary the speed of the direct drive main fan to achieve the required vacuum rating. Please see the control loop graphic on page 3.

What is required?

- Pressure Sensor (mounted to drum enclosure, near inlet)
- Smart Relay or PLC (mounted in control panel)
- VFD for Main Fan (mounted in control panel)

How does it work?

The operator enters the desired inlet vacuum setpoint on the control panel HMI. If there is not an HMI on the panel, then the operator enters the value directly into the smart relay inside the panel. The Osprey recommended inlet setpoint for standard applications is –3" wc (-750 Pascal).

A pressure sensor is mounted on the drum filter enclosure near the drum filter inlet. This sensor generates a 4-20 mA signal based on the vacuum inside the enclosure. A smart relay or PLC inside the control panel receives the 4-20 mA signal from the pressure sensor. This signal is converted to a numeric value representing the vacuum level, and this value is compared against the setpoint value. If the actual reading matches the setpoint, then no adjustment is required to the main fan speed. If the values do not match, then the PLC or smart relay calculates the new speed requirement for the main fan. Once the comparison and calculation is complete, the PLC outputs a 4-20 mA speed signal to the main fan VFD.

The VFD converts this 4-20 mA signal and outputs the required speed signal (Hz) to the main fan. The VFD is programmed with a maximum allowable speed output to ensure that the fan will never generate more vacuum than is specified (by Osprey) for the particular filter design. This maximum speed output is based on the fan curve of the main fan and is typically selected so that the maximum static pressure the main fan can generate is –12" wc (-3000 Pascal). The main fan speed loop is only active when the system is in automatic mode. If the system is run in manual mode, the operator manually enters the desired speed of the main fan on the VFD keypad or HMI.

Benefits

The primary benefits of implementing an inlet pressure control loop on a drum filter are improving the stability of the process conditions and decreasing the energy costs of operating the filter. In addition, the pressure control loop reduces noise, lowers maintenance costs, and reduces the particle emissions from the filter.

Benefit #1 – Stable process conditions

To understand the benefit of a pressure control loop on the process, it is helpful to first understand how a typical drum filter operates without a control loop. In this case, the vacuum level of the main system fan is held constant (at –12" wc / -3000 Pa typically), and the vacuum level at the drum filter inlet varies depending on how clean or dirty each filter stage is.

Osprey Corporation
1835 Briarwood Road
Atlanta, GA 30329 U.S.A.
Ph (404) 321-7776
Fax (404) 634-1401

In most applications, the result is that the drum filter inlet vacuum level ranges from between –9” wc (-2750 Pa) when all of the filter stages are clean, to –3” wc (-750 Pa) when the filters stages are dirty. This inlet vacuum fluctuation occurs slowly, and it typically takes several months to cover the full range.

With an active inlet pressure control loop, the vacuum level provided by the drum filter to the process is held CONSTANT. As the drum filter media and filter stages get dirty and have increased pressure drops across them, the system automatically adjusts the main fan speed so that the inlet vacuum remains the same. The result is that the production line always sees the same vacuum level (“boost”) from the filter.

Benefit #2 – Energy savings

In a traditional system, the main fan is always operating at one speed and at one rating. This speed and rating is selected based on the ‘worst case’ system condition, when the filter stages are extremely dirty and have their highest possible pressure drop. The brake horsepower required at this rating is higher than what it is if the fan is operating at a lower speed and a lower pressure rating. For example, a typical main system fan would need to run at 1631rpm to generate 22,000 CFM @-12”. The BHP would be 50HP. For the same fan to operate at 22,000 CFM @ only –6”, the RPM would be reduced to 1321, and the BHP would be 27HP.

Please refer to the fan curve below for a graphic depiction of these ratings.

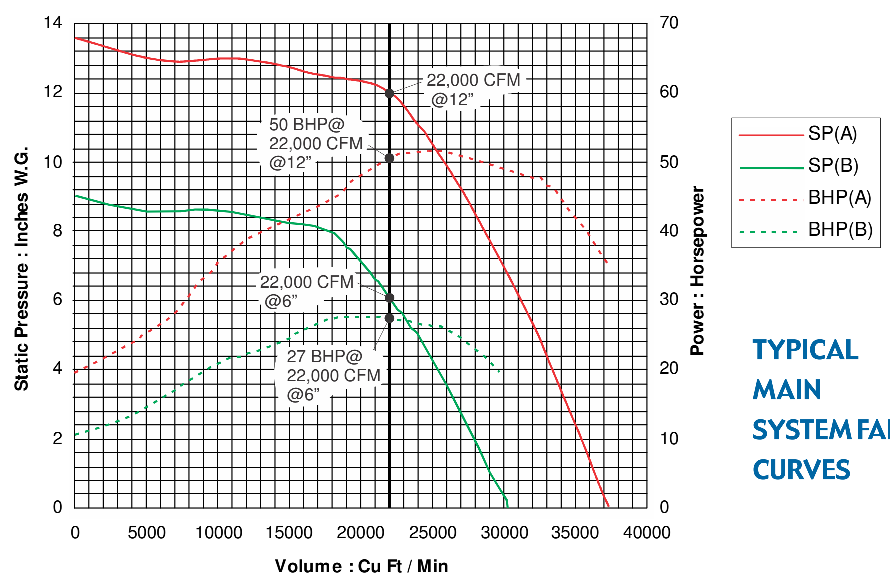
With the pressure control loop active, the main fan operates at a reduced speed and rating most of the time because the filter stages are either clean, or are in the ‘loading’ phase. The fan is therefore operating at a reduced brake horsepower point on the curve and requires less energy to operate. In addition, the main fan is direct drive instead of belt drive. The energy losses associated with the inefficiencies of the belt drive system are eliminated. Detailed energy saving calculations can be completed for each specific application, but payback periods are generally in the 10-12 month range or less.

ADDITIONAL BENEFITS

Reduced Emissions are achieved by lowering the vacuum levels in the clean side of the filter.

Noise Reduction is achieved by operating the main fan at reduced speeds and by eliminating the belt drive components from the fan.

Reduced Maintenance costs are achieved by eliminating the belt drive components.



TYPICAL MAIN SYSTEM FAN CURVES

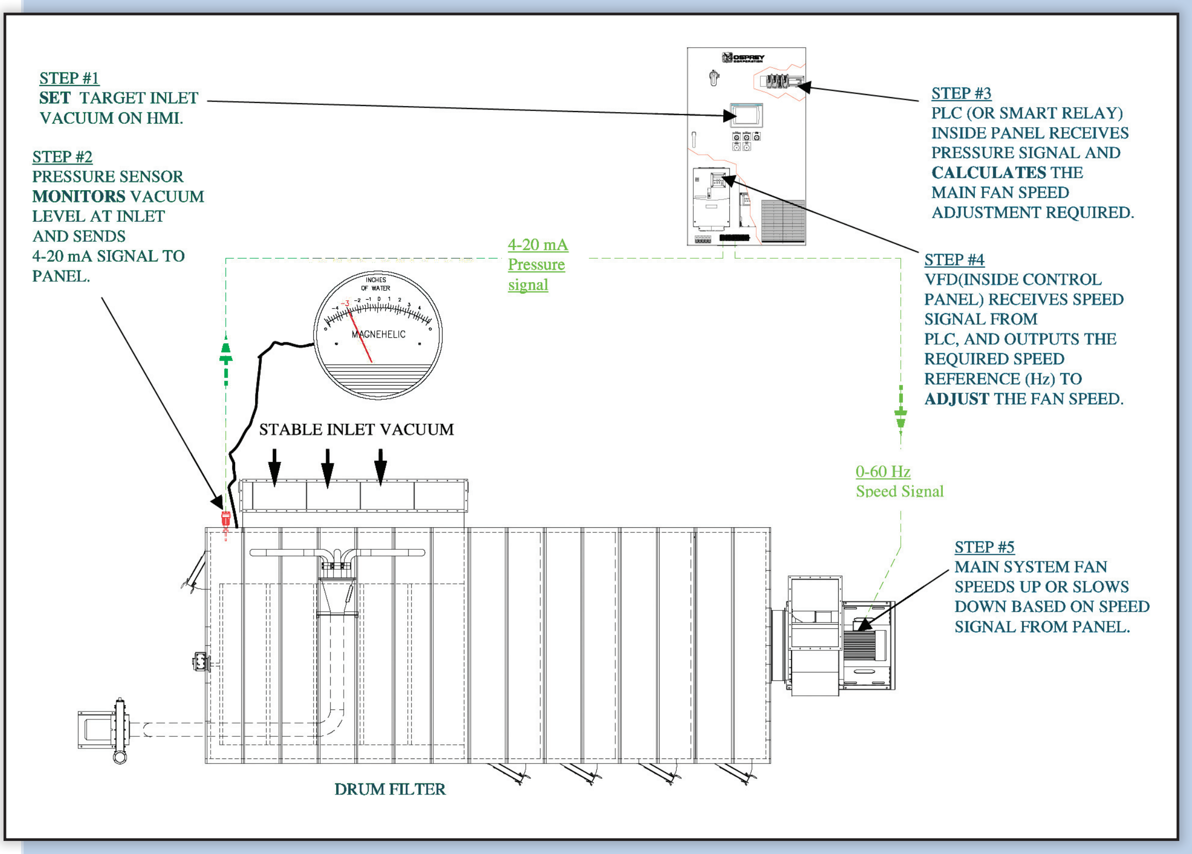
A OMC–1736 RPM = 1631 ; Density = 0.0728 Lb/CF ; Width = 100.00% 50 BHP at 22,000 CFM @ -12”
B OMC–1736 RPM = 1321 ; Density = 0.0739 Lb/CF ; Width = 100.00% 27 BHP at 22,000 CFM @ -6”

Osprey Corporation
1835 Briarwood Road
Atlanta, GA 30329 U.S.A.
Ph (404) 321-7776
Fax (404) 634-1401

CONTROL LOOP SCHEMATIC

INLET PRESSURE CONTROL LOOP

MAINTAINS THE INLET VACUUM LEVEL AT THE DESIRED SETPOINT



Osprey Corporation
1835 Briarwood Road
Atlanta, GA 30329 U.S.A.
Ph (404) 321-7776
Fax (404) 634-1401

Contact Us

Osprey Corporation
1835 Briarwood Road, NE
Atlanta, GA 30329
Phone: 404-321-7776
Fax: 404-634-1401

Marsha Vice (Customer Service)
E-mail: marsha.vice@ospreyfilters.com
Phone: 404-320-2354

Steve Smith (Sales)
E-mail: steve.smith@ospreyfilters.com
Phone: 404-320-2352

Kirk Harpole (Sales)
E-mail: k.harpole@ospreyfilters.com
Phone: 404-679-9880

Marty Price (Sales and Product Development)
E-mail: martin.price@ospreyfilters.com
Phone: 404-320-2349

Ivan Skott (Sales)
E-mail: ivan.skott@ospreyfilters.com
Phone: 404-679-9892

David Ankenbrandt (Sales)
E-mail: david.ankenbrandt@ospreyfilters.com
Phone: 404-320-2341

Oliver Smyth (Sales)
E-mail: osmyth3@bellsouth.net
Phone: 334-263-9200

Christoph Ritter (Sales Manager Europe and Middle East)
E-mail: c.ritter@ospreyfilters.com
Phone: 33-492-62-63-47

Dave Colburn (Technical Service Manager)
E-mail: david.colburn@ospreyfilters.com
Phone: 404-320-2344

Jeff Orwig (Spare Parts Sales Manager)
E-mail: jeff.orwig@ospreyfilters.com
Phone: 404-320-2347

Isacque Nixon (Spare Parts Sales)
E-mail: isacque.nixon@ospreyfilters.com
Phone: 404-320-2355

Sean Wallace (Controller)
E-mail: sean.wallace@ospreyfilters.com
Phone: 404-679-9879

Todd Dietz (Engineering Manager)
E-mail: todd.dietz@ospreyfilters.com
Phone: 404-679-9882

Ken Best (Operations)
E-mail: ken.best@ospreyfilters.com
Phone: 404-320-2359

Johnny Harrell (Logistics)
E-mail: johnny.harrell@ospreyfilters.com
Phone: 404-427-1515

Plastics Representatives

Chris Strzelecki – Southeast USA
E-mail: chris@plastequip.com
Phone: 678-428-9262
Fax: 678-455-8548

Rob Northrup – Southeast USA
E-mail: rob@plastequip.com
Phone: 678-428-9261
Fax: 770-242-1386

Andrew J. Haesler – DE, MD, NJ, PA, NY, VA (Northern), USA
E-mail: ajhinc@aol.com
Phone: 212-673-7740
Fax: 212-217-9566
Cell: 917-744-8052

Jeff Opad – IL, MN, WI, USA
E-mail: jeff@jemmco.com
Web Site: www.jemmco.com
Phone: 262-512-9559
Fax: 262-242-0432
Cell: 262-488-3061

Bob Fasulo – AR, LA OK, TX, USA
E-mail: fasulo@flash.net
Web Site: www.kaalco.com
Phone: 972-250-6762
Fax: 972-250-0250
Cell: 972-740-0696

Dave Lawson – Canada
E-mail: dlawson@spectranet.ca
Web Site: www.ice-equipment.com
Phone: 416-717-1846
Fax: 416-717-1847

Eduardo Koch G.– Mexico
E-mail: gekonorm@avantel.net
Phone: 52-5-556-833908
Fax: 52-5-556-684871

Soft Disposables Offices and Representatives

Tecnoeuropa S.A. de C.V. – Mexico
Jaime Cattori
E-mail: jcattori@tecnoeurope.com.mx
Phone: 52-55-5020-5070

Osprey Assessoria – Brazil
Paulo Roberto Nascimento Borba
E-mail: prnborba@uol.com.br
Phone: 55-12-3672-2000
Fax: 55-12-3672-3449

Dougmac Pty. Ltd. – Australia and New Zealand
Bruce MacGregor, Doug MacGregor
E-mail: email@dougmac.com.au
Phone: 61-2-9791-9644
Fax: 61-2-9791-9677

Moritani & Co. Ltd – Japan, Korea and China
Ando Hiroyuki
E-mail: ando.hiroyuki@moritani.co.jp
Phone: 81-3-3278-6273